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Observed and Estimated Bycatch of Salmon in U.S. West Coast Fisheries, 2002–19

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(Richerson et al. 2020)¹

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FISHERIES**

Observed and Estimated Bycatch of Salmon in U.S. West Coast Fisheries, 2002–19

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Report Description

This data report summarizes the observed and estimated bycatch of all salmon species observed in fisheries monitored by the West Coast Groundfish Observer Program (WCGOP), the At-Sea Hake Observer Program (A-SHOP), the Electronic Monitoring (EM) Program, and the Catch Monitor (CM) Program. WCGOP and A-SHOP are part of NOAA Fisheries's Northwest Fisheries Science Center, and the EM and CM Programs are run by the Pacific States Marine Fisheries Commission (PSMFC). We present bycatch in terms of both weight and numbers of individuals. Methods used in this report follow the methods presented in the previous salmon report (Somers et al. 2015) and the most recent groundfish mortality report (Somers et al. 2020).

The Fisheries Observation Science Program (FOS) manages both A-SHOP and WCGOP. A-SHOP observes the hake fleet that processes catch at sea, while WCGOP observes a number of fleets that deliver catch shoreside for processing, including sectors that target and incidentally impact groundfish. Both programs place trained scientists on board commercial fishing vessels to observe and sample catch; WCGOP specifically focuses on sampling at-sea discards. Once landed shoreside, catch is sampled by the CM Program; for vessels fishing under maximized or optimized retention, this sampling quantifies the majority of their bycatch. All salmon encountered by EM fisheries are either observed at sea or retained and sampled dockside. This report also includes fish ticket landings data from the Pacific Fishery Information Network (PacFIN). Every year this report is updated to include the newest year of data, the most current data from FOS and PacFIN for previous years, and the most recent data processing procedures. Data processing updates are described in the annual groundfish mortality report, which is available in draft form annually in the Pacific Fishery Management Council September Briefing Book and later in the year in final form via a NOAA Technical Memorandum.

In this report, for each sector in which salmon bycatch occurred, we provide two data files, one showing observer or sampling coverage for all strata with observed or electronically monitored effort and a second showing bycatch data for only those strata with salmon bycatch. Some tables include seasonal, latitudinal, and/or depth strata as possible while preserving confidentiality. For the shoreside-processed fisheries, seasons are defined as winter (January to April and November to December) or summer (May to October); for the at-sea processed fisheries, seasons are defined as spring (from 15 May, when the season opens, to 30 June) or fall (1 July to 31 December). Latitudinal divisions are defined as Cape Falcon (lat 45.77°N), Cape Blanco (lat 42.83°N), and Cape Mendocino (lat 40.50°N). For the catch share bottom trawl fishery and catch share EM fisheries, depth strata have been updated to reflect depth bins more relevant to salmon management (0–100 fathoms [fth], 100–150 fth, 150–250 fth, and 250+ fth). This update applies to estimates disseminated in 2019 and thereafter. This may result in slightly different estimates of total bycatch relative to earlier reports. In addition, we include an estimate of bycatch rates for A-SHOP and catch share fisheries (total salmon bycatch divided by total landed target weight in a stratum). All weight units are in metric tons (mt), except for individual fish in biological data tables, which are in kilograms (kg). All count values were rounded to an integer value using standard rounding rules in each table for presentation purposes; for that reason, a sum of the rounded values over rows within sector-level tables may not be equivalent to the value

in the final summary tables. Similarly, zero values represent cases where catch or salmon was present, but the numeric value was less than the digits shown. In cases where fewer than three vessels were active, data cannot be shown in order to maintain confidentiality; these strata are reported as asterisks (*). Additionally, the at symbol (@) represents strata for which the potential bootstrapping pool had less than three vessels and so could not be estimated. This represented less than 0.25 percent of fishing effort in regards to yearly landings. Finally, the hash symbol (#) represents cases where only a single haul with salmon was observed, so the standard error calculation is not informative.

In addition to sector-specific coverage and bycatch information, we also include a bycatch summary table as well as summaries of the biological data collected by WCGOP, A-SHOP, and the CM Program.

We do not present tribal fishery data.

Trends, 2002–19

We present trends in Chinook and coho salmon bycatch because they are the most likely to be impacted by observed fisheries, and because ocean troll fisheries target both species. In addition, both species include multiple populations that are listed under the Endangered Species Act. Salmon bycatch in groundfish fisheries has the potential to cause friction between the groundfish and salmon sectors. This has been the case for Chinook salmon, and high levels of bycatch in some years have created an ongoing fisheries management challenge. We present data beginning in 2002, when WCGOP began observing these fisheries. Chinook salmon bycatch in the hake fishery as a whole has been volatile, with a high in 2014. In 2019, bycatch was slightly lower than 2018 and similar to 2017. Non-catch share (NCS) bycatch has been minimal across all years. After extremely high bycatch in 2002 and 2003, mostly in the limited entry bottom trawl fishery, Chinook salmon bycatch has remained relatively low in the shoreside non-hake fishery. In 2014, Chinook salmon bycatch by the shoreside non-hake fishery was the highest since 2005 (mostly attributed to the catch share bottom trawl fishery), but bycatch was relatively low from 2016–19.

Over the time period examined, coho salmon bycatch was generally an order of magnitude lower than Chinook salmon bycatch, with considerable amounts of interannual variability. Bycatch in the hake fishery was elevated in 2002, 2005, 2007, 2011, 2014, and 2019 compared to other years when bycatch was lower. Bycatch in the NCS and shoreside non-hake fisheries has remained at moderate levels across all years, though NCS coho salmon bycatch in 2018 and 2019 was higher than the preceding several years. In 2019, coho salmon bycatch in these sectors was higher than all other years except 2014. In 2019, the first incidence of coho salmon bycatch was observed in the Nearshore South, OA California Halibut, and Directed Pacific Halibut fisheries. Each of these sectors saw one observed coho salmon, expanding to an estimated sector total of 26, 4, and 8 fish, respectively. These represent about 29%, 4%, and 9% of the NCS total estimated coho salmon bycatch, respectively. Note that in low encounter rate situations like this, ratio estimators can result in estimates with greater uncertainty. In addition, note that the Directed Pacific Halibut fishery was not observed prior to 2017.

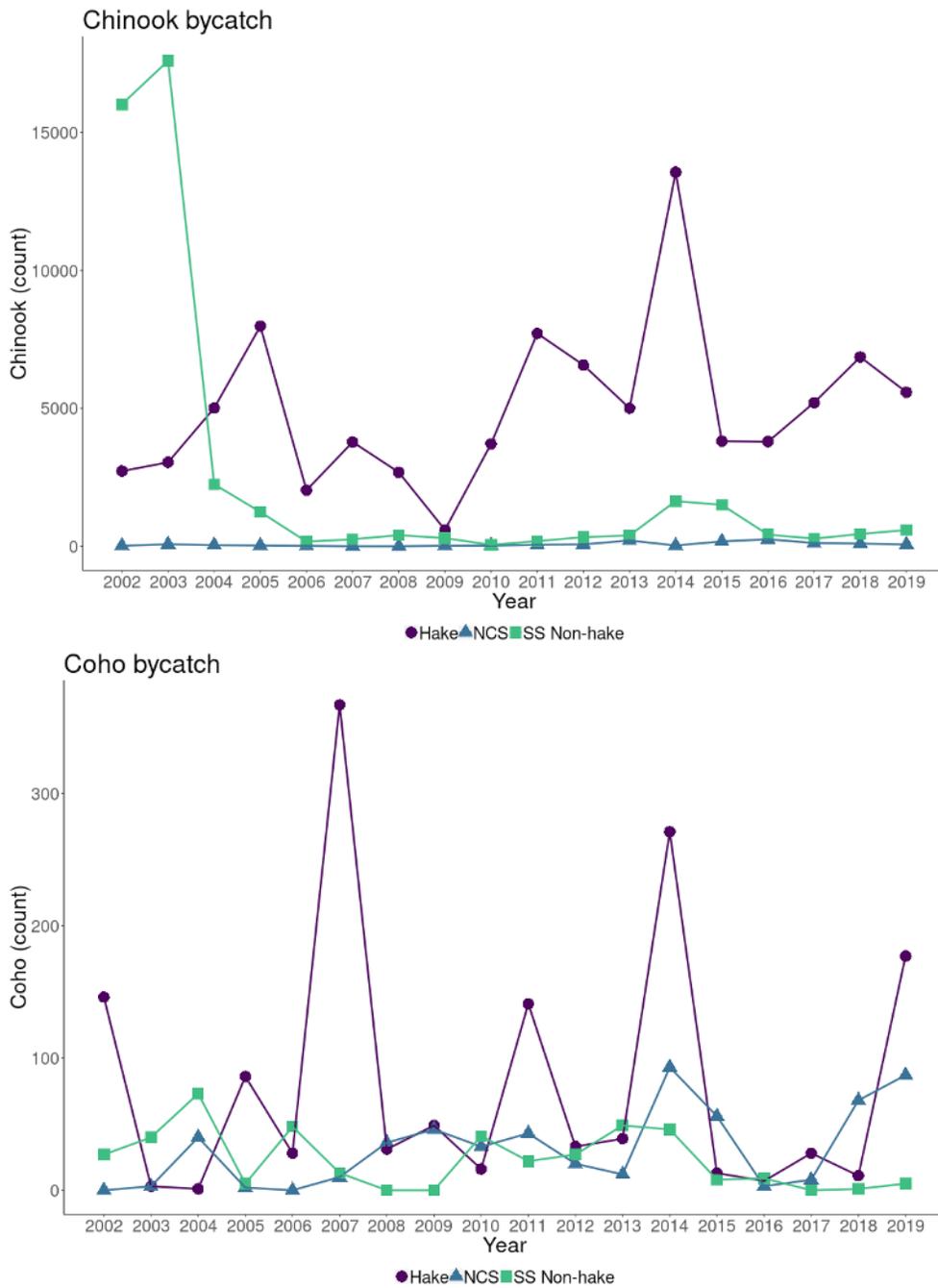


Figure 1. Chinook (upper panel) and coho (lower panel) salmon bycatch in fisheries monitored by A-SHOP, CM, EM, and WCGOP, 2002–19. *Hake* includes at-sea catcher processors, at-sea mothership catcher-vessels, and shoreside processors. *Non-catch share (NCS)* includes non-catch share exempted fishing permits, sablefish primary, nearshore, open access (OA) California halibut, pink shrimp, and OA hook-and-line. *Shoreside (SS) Non-hake* includes shoreside limited entry (LE) and catch share (CS) bottom trawl, CS fixed gear, CS midwater rockfish, and LE California halibut.

Tables

The tables described below can be downloaded from this data report's [NOAA Institutional Repository](#)¹ record by clicking on the "Supporting Files" tab.

Table 1. Observed vessels, trips, hauls, catch, and salmon interactions, as well as total fleet landings, stratified by year, season, salmon management area, and depth interval for the LE trawl fishery.

Table 2. Observed and expanded salmon bycatch in the LE trawl fishery.

Table 3. Observed vessels, trips, hauls, catch, and salmon interactions, as well as total fleet landings, stratified by year and season for the LE CA halibut fishery. To preserve confidentiality: 2010 data are reported in Tables 7 and 8, combined with OA CA halibut; 2011 and 2013 data are reported in Table 16, combined with IFQ Bottom Trawl; 2012 data cannot be reported; no fishing effort in LE CHLB has occurred since 2013.

Table 4. Observed and expanded salmon bycatch in the LE California halibut fishery.

Table 5. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by year for the OA CA halibut fishery. Strata not listed were not observed.

Table 6. Observed and expanded salmon bycatch in the LE California halibut fishery.

Table 7. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings for the combined LE & OA CA halibut fishery, combined in 2010 to maintain confidentiality.

Table 8. Observed and expanded salmon bycatch in the combined LE & OA CHLB fishery in 2010.

Table 9. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by year and area for the LE sablefish primary fishery, using hook-and-line gear. Strata not listed were not observed.

Table 10. Observed and expanded salmon bycatch in the LE sablefish primary fishery using hook-and-line gear.

Table 11. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by state, year, and area for the pink shrimp fishery. Strata not listed were not observed.

Table 12. Observed and expanded salmon bycatch in the pink shrimp fishery.

Table 13. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, stratified by state, year, and area for the nearshore fishery. No salmon interactions south of 40°10' N lat. occurred prior to 2019, so we only include information for the 2019 Nearshore South fishery here.

Table 14. Observed and expanded salmon bycatch in the Nearshore fishery.

Table 15. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, for the OA hook-and-line fishery. Only 2018 is shown for simplicity (no salmon bycatch in other years).

Table 16. Observed and expanded salmon bycatch in the open access hook-and-line fishery.

Table 17. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings, for the directed Pacific halibut fishery. Note that WCGOP began observing this fishery in 2017.

Table 18. Observed and expanded salmon bycatch in the directed Pacific halibut fishery.

¹<https://repository.library.noaa.gov/>

Table 19. Observed vessels, trips, hauls, catch, and salmon, as well as fleet landings, stratified by year, season, depth bin, and salmon management area for catch shares non-hake bottom trawl, including non-hake midwater trawl in 2011 and LE California halibut in 2011 and 2013.

Table 20. Observed at-sea, estimated unknown, landed, and total salmon bycatch in the catch shares non-hake bottom trawl fishery, including non-hake midwater trawl in 2011 and LE California halibut in 2011 to 2013.

Table 21. Observed vessels, trips, hauls, catch, and salmon interactions, as well as fleet landings for the CS hook-and-line fishery.

Table 22. Observed at-sea, estimated unknown, landed, and total salmon bycatch in the CS hook-and-line fishery.

Table 23. Observed vessels, trips, hauls, catch, and salmon, as well as fleet landings, stratified by year, target strategy, season, and salmon management area for shoreside catch shares non-EM midwater trawl. To maintain confidentiality, data from the 2019 midwater hake trawl sector is included in Tables 25 and 26, and data from the non-hake midwater trawl in 2011 is include in Tables 20 and 21. In 2015, the basis of the definition for shoreside midwater changed from the captain's stated target to the proportion hake landed.

Table 24. Observed at-sea, estimated unknown, landed, and total salmon bycatch in the catch shares midwater trawl fishery. To maintain confidentiality, data from the 2019 midwater hake trawl sector is included in Tables 25 and 26, and data from the non-hake midwater trawl in 2011 is include in Tables 19 and 20. In 2015, the basis of the definition for shoreside midwater changed from the captain's stated target to the proportion hake landed.

Table 25. Effort in the electronically-monitored (EM) portion of the shoreside catch shares trawl fleet, based on EM, logbook, and fish ticket data. Data for the 2019 non-EM midwater hake sector is combined with EM data here to preserve confidentiality (see Tables 23 and 24 for all other non-EM midwater hake information).

Table 26. Salmon bycatch EM portion of the shoreside catch shares trawl fleet, based on EM, logbook, and fish ticket data. Data for the 2019 non-EM midwater hake sector is combined with EM data here to preserve confidentiality (see Tables 23 and 24 for all other non-EM midwater hake information). All salmon are required to be retained and sampled by shoreside catch monitors.

Table 27. Observed vessels, hauls, and salmon interactions, as well as fleet landings, stratified by sector, year, and season for the at-sea hake fishery.

Table 28. Observed salmon bycatch in the at-sea hake fishery.

Table 29. Summary of salmon bycatch count and weight by species, sector, and year. Bycatch in the shoreside catch shares fisheries include both EM and 100% observed sub-sectors. Weights were not recorded in the shoreside hake EFP sector.

Table 30. Summary of biological data for at-sea salmon catch, separated by sector, collected by WCGOP observers from 2002 to 2019. All data was not available for every specimen. Due to 100% coverage in Catch Shares sectors, more biological data is typically collected.

Table 31. Summary of biological data for salmon discarded shoreside, collected by the Catch Monitor (CM) program 2010 to 2019. All data was not available for every specimen, but 100% coverage of the catch typically leads to greater collection of biological data than in other fishery sectors.

Table 32. Summary of biological data for salmon species, separated by sector, collected by A-SHOP observers from 1980 to 2019. All data was not available for every specimen. 100% coverage of the catch typically leads to greater collection of biological data than in other fishery sectors.

References

- Somers, K. A., M. A. Bellman, J. E. Jannot, Y.-W. Lee, J. McVeigh, and V. Tuttle. 2015. Observed and estimated total bycatch of salmon in the 2002-2013 U.S. west coast fisheries. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle.
- Somers, K. A., J. E. Jannot, K. E. Richerson, V. J. Tuttle, N. B. Riley, and J. T. McVeigh. 2020. Estimated discard and catch of groundfish species in the 2019 U.S. west coast fisheries. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle.



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